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(71) Applicant: **Amber Doors Limited**
Hoyland, Barnsley S74 9TG (GB)

(72) Inventors:
- **Hamilton, John**
  Hoyland, Barnsley S74 9TG (GB)
- **Kulmer, Adam Stephen**
  Hoyland, Barnsley S74 9TG (GB)

(74) Representative: **Walsh, David Patrick et al**
Appleyard Lees,
15 Clare Road
Halifax HX1 2HY (GB)

(54) A roller shutter locking mechanism

(57) The roller shutter locking mechanism comprises a guide rail (2) for the slats (8,10) of the shutter and a blocking unit (6) located in the guide rail (2) which cooperates with the slats (8,10) when the roller shutter is in the closed position. A locking unit (4) extending from the slats (8,10) of the shutter provides the cooperation between the slats (8,10) and the blocking unit (6), the locking unit (4) having a blocking unit (6) engaging position actuated when the shutter is closed and a disengaged position activated by the shutter being raised from above the blocking unit (6). Between the said neighbouring slats (8,10) there is an expandable telescopic connection (44,46,48).

The telescopic connection (44,46,48) provides a mechanism whereby the locking bar (16a,16b) can be retracted without simultaneously applying upward pressure thereto. The telescopic expandability of the gap between the neighbouring slats (8,10) is only actuatable by applying upward pressure from a point above the telescopic connection (44,46,48).

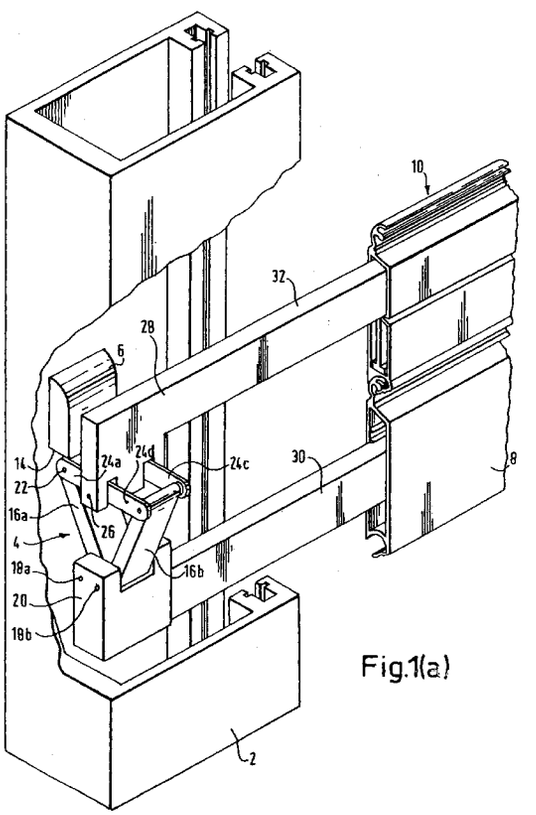

Fig.1(a)

EP 0 930 417 A2

Description

[0001] The present invention relates to a roller shutter locking mechanism. Roller shutters have been and still remain the most common method of providing additional security for shop windows. In addition, they are commonly used to prevent access to buildings or parts of buildings. Traditionally, roller shutters were operated manually by a chain or other suitable mechanism connected to a roller which was thereby retracted or advanced accordingly. A suitable conventional lock was traditionally used to lock the shutter in the closed position. Modern shutters are, generally, motor driven so that the roller can be advanced or retracted simply by means of a suitable switch. Manual locks may be used with the motor driven roller shutters but this causes a problem if the operator forgets to manually unlock the shutter which may cause the motor driving the roller to become damaged or burn out. Solenoid locks can be used to override this problem but such locks tend to be expensive and bulky if the locks are to be of sufficient size. Furthermore, external locks are undesirable, presenting a target for unauthorised persons. As a result, there has been a move towards shutters which simply rely upon their own weight when closed and the inertia of the motor driven roller. Unfortunately, although such rollers are difficult to lift manually, they can be raised by means of a suitable jacking device.

[0002] Magnetic locks have been applied to provide additional security which is not visible from the exterior of the location. However, magnetic locks suffer from the known draw back of failing under damp or wet conditions.

[0003] A potential solution is described in Dutch patent 8401204 which describes a blocking system located in the guide rails at the sides of the slats of the shutter. The shutters slats pivot about their linkage axes. The shutter is guided at its sides by profiling resembling a periodic wave with blocking steps. The shutter falls under its own weight, sliding smoothly over the wave. As the bottom edge of the shutter reaches the ground, the slats pivot into a diagonal arrangement with the pivot axis beneath the blocking steps. Lifting the bottom slat pushes the said pivot axes against the steps and will thus not raise the shutter. However, raising the top slat pulls the axes away from the steps and the shutter can be raised.

[0004] Unfortunately, the arrangement suffers from the draw back of requiring expensive guide rail profiling. In addition, the slats are not always raised smoothly and snagging of the slats may lead to motor damage or motor burn out. Furthermore, the mechanism is only suitable for single skin shutters as it relies upon deformation of the slats into a zig-zag arrangement. Double skin shutters which are more secure do not deform so easily and the mechanism is unsuitable for such shutters.

[0005] Many insurance policies may require the provision of a double skin shutter.

[0006] According to a first aspect of the present invention there is provided a roller shutter locking mechanism comprising a guide rail for the slats of the shutter and a blocking unit located in the guide rail which cooperates with the slats when the roller shutter is in the closed position, characterised in that a locking unit extending from the slats of the shutter provides the said cooperation between the slats and the blocking unit, the locking unit having a blocking unit engaging position actuated when the shutter is closed and a disengaged position activated by the shutter being raised from above the blocking unit.

[0007] Preferably, the locking unit comprises a pivotable locking bar which pivots from a first position wherein it may engage the blocking unit when urged against it and a second position wherein it may not engage the blocking unit. Preferably, the pivoting from the first to the second position is actuated by raising the shutter from above the blocking unit.

[0008] Preferably, the pivot of the locking bar is located below the blocking unit and the locking bar pivots outwardly from the slats to the blocking unit engaging position.

[0009] Advantageously, the outwardly pivoted locking bar is urged outwardly, about the pivot axis, by any upward pressure on the slats from below and thus remains locked in position.

[0010] Preferably, the locking bar has at least one pivotable arm connected to its blocking unit engaging end which arm is pivotable at both its ends, the first end being connected to the locking bar and the second end being connected to a neighbouring slat so that upward movement of the said slat causes upward movement of the second end pivot of the pivot arm, thus causing the pivot arm to pivot downwardly and inwardly about the said second pivot which thereby causes the locking bar to retract inwardly so that engagement with the blocking unit is no longer possible.

[0011] Preferably, the pivotable arm is connected to the said neighbouring slat by a fixed arm which is preferably, aligned with and extends from the said slat.

[0012] Preferably, the main pivot of the locking bar is connected to a downwardly neighbouring slat with respect to the slat to which the pivotable arm is connected. Preferably, the pivot of the locking bar is connected to the said downwardly neighbouring slat by a further fixed arm which is aligned with and extends from the said downwardly neighbouring slat. Preferably, between the said neighbouring slats there is an expandable connection. Preferably, the expandable connection is a telescopic connection and is, preferably, at least partially retracted when the shutter is in the closed position so that, advantageously, upward pressure on the upwardly neighbouring slat from above causes the telescopic connection to expand before any upward pressure is exerted upon the downwardly neighbouring slat.

[0013] Advantageously, the telescopic connection provides a mechanism whereby the locking bar can be

retracted without simultaneously applying upward pressure thereto. Furthermore, the telescopic expandability of the gap between the neighbouring slats is only actuatable by applying upward pressure from a point above the telescopic connection.

[0014] Preferably, a further pivotable locking bar and at least one arm are provided which are the mirror image of the first locking bar and arm and located adjacent to the first locking bar and pivot arm. Preferably, further blocking units are provided on the opposite side of the guide rail to, preferably, engage with the further locking bar and pivotable arm. Alternatively, the further locking arm and pivotable arm may be provided so that the unit is handed and can be fitted into a guide rail on either side of the shutter.

[0015] Preferably, to ease the mechanism, two pivotable arms are provided one on each side of the blocking unit engaging end of the locking bar.

[0016] The locking unit including the locking bar, pivotable arm(s), fixed arm(s) and pivot(s) may be independently made from any suitable material known to the skilled man. Preferably, however, the materials are chosen so as to be compatible with aluminium and/or galvanised steel shutter units.

[0017] The locking mechanism may be fitted to both vertically closing and horizontally closing shutter units and references to upward(ly), downward(ly), above and below in the foregoing and hereinafter should be construed accordingly ie upward(ly) and above are intended to refer to a greater proximity to the roller and downward (ly) and below refer to more distal with respect to the roller. However, the invention is particularly suitable for vertically closing shutters which an unauthorised person may attempt to raise by applying upward pressure from below or, more particularly, from the bottom slat or the base of the shutter.

[0018] Typically, the expandable connection comprises a specially adapted slat. Preferably, the telescopic effect is produced by a piston and cylinder arrangement with, preferably, the head of the piston being wider than the neck of the cylinder so that the two parts remain connected when fully extended. Although a telescopic arrangement is described, it will be appreciated that other mechanisms known to the skilled man would provide the expandable connection.

[0019] Advantageously, the two parts of the slat are machined so that the piston is inaccessible when the shutter is in a closed position.

[0020] Preferably, in a shutter in accordance with the present invention, there are at least two locking points. The first locking point is, preferably, in the proximity of the roller and the second locking point is, preferably, in the proximity of the most distal slat from the roller. Preferably, the locking point associated with the roller end of the shutter is connected to slats which are obscured from view. In such a locking shutter, it is not possible for an unauthorised person to retract the locking mechanism because he is unable to locate a suitable device above the slats which are obscured.

[0021] According to a second aspect of the present invention there is provided a roller shutter having a locking mechanism in accordance with the first aspect of the present invention.

[0022] Preferably, the roller shutter has at least two locking mechanisms, one to be fitted in the proximity of the roller when the shutter is in the closed position and one to be fitted in the proximity of the bottom slat.

[0023] According to a third aspect of the present invention there is provided a locking unit in accordance with the characterising part of the first aspect of the present invention which is adapted for use on doors, windows and other blockable opening/closing devices.

[0024] An embodiment of the invention will now be described with reference to the accompanying drawings in which:-

figure 1a shows a perspective view of a locking mechanism in accordance with the present invention with the guide rail cut away and the lock engaged against the locking unit;

figure 1b shows a perspective view of the locking mechanism with the lock disengaged;

figure 2a shows a cross-sectional view of an extended telescopic slat in accordance with the present invention; and

figure 2b shows a cross-sectional view of a retracted telescopic lath in accordance with the present invention.

[0025] Referring to figure 1a, part of a guide rail 2 is shown with a section of the outer wall cut away to reveal a locking mechanism 4 and a blocking unit 6. The guide rail 2 is generally a "U" shaped channel section in which the lateral ends of the laths or slats, such as 8, 10, of a roller shutter are guided when the shutter is advanced or retracted on the roller (not shown). In a typical vertical shutter, two guide rails are located at opposed lateral ends of the shutter and guide the shutter in its trajectory off and on the roller.

[0026] The guide rail 2 has a blocking unit 6 moulded, welded or fastened to the side thereof. The two vertical sides and lower horizontal end of the blocking unit have plain faces at right angles to the face of the guide rail and the upper horizontal end has a convex face. The lower end 14 provides an upward block to locking bar 16. The locking bar 16 has pivots passing laterally through either end thereof. The lower pivot 18 is journalled in a sub frame 20 and the upper pivot 22 forms a pivotable connection with pivoting arms 24. The pivoting arms 24 also have a pivot 26 passing through their respective other ends which pivot is itself journalled in a further sub frame 28, the latter being located directly above the first sub frame 20. Each sub frame 20, 28 is

integrally connected with a respective arm 30, 32. The arms 30, 32 are located in and machined to be close fitting with the interior cavity of respective adjacent laths 8, 10. In the embodiments shown in figure 1a, the laths have been shown spaced from the guide rail 2 for clarity. In use, the proximal ends of the laths would protrude into the guide rail and be located adjacent to the sub frames 20, 28, the arms extending into the cavity of the respective laths.

[0027] Returning to the locking mechanism, the sub frame 20 accommodates two handed locking bars 16a, 16b, each having its own pivot spindle 18a, 18b spaced from each other and journalled in the sub frame 20. The other distal ends of the locking bars 16a, 16b each have two pivotable arms 24a, 24b and 24c, 24d which respectively pivot about the respective ends of a spindle extending horizontally through the said ends of the locking bars. The other ends of the pivotable arms 24a, 24b, 24c, 24d are pivotally fixed in opposite pairs about a further pivot spindle 26 which is journalled in sub frame 28 of arm 32. The sub frame 20 has a single recess in which to locate both proximal ends of the respective locking bars whereas sub frame 28 has a pair of spaced recesses to accommodate the proximal ends of the paired pivotable arms 24a, 24b, 24c, 24d.

[0028] Referring to figure 2a and b, a cross section through three generally hollow laths connected together in the usual way is shown. The upper and lower laths 8, 12 are of customary design being of substantially hollow section. The middle lath 10 comprises two sections, an upper section 40 and a lower section 42. The upper section 40 has a fixed piston arm depending downwardly therefrom and an integral piston head 46 at its end. The lower section 42 comprises a cylinder 48 which is designed to be close fitting with the piston head 46, and a cylinder neck 50 which provides a centrally disposed opening into the upper part of the lower section 42 which is designed to be close fitting and allow sliding engagement with the arm 44 of the piston head 46. When the piston head 46 is fully inserted into the cylinder 48 the dimensions of the slat 10 are similar to the adjacent slats 8, 12. However, when the telescopic section is fully extended so that the piston head 46 abuts against the internal surface of the top of the cylinder 48, the width of the slat is about one and a half times the size of an ordinary non-telescopic slat. The additional length provided by the telescopic slat allows the locking mechanism 4 to be disengaged from the blocking unit 6 when the upper section 40 of the slat 10 is raised whilst at the same time not immediately transmitting the upward force onto slat 8 located immediately below slat 10.

[0029] The arm 32 of the upper sub frame 28 is located in the upper section 40 of the lath 10 whilst the moveable piston head 46 is housed in the lower section thereof. As the upper section of the slat 10 is raised, the piston head 46 is raised from its fully inserted position in the lower section 42 to its fully retracted position when the telescopic arm 44 of the piston head 46 is fully extended. At the same time as the piston head 46 is being retracted, the upward movement of the sub frame 28 causes the pivotable arms 24 to pivot in the sub frame 28 about the pivot spindle 26 causing the other ends of the pivotable arms 24 to retract inwardly drawing the engaging end of the locking bar 16 away from the blocking face 14 of the blocking unit 6 into the vertical non-engaging position as is clearly shown in figure 1b. Once the locking bars are retracted inwardly, the laths may move freely in the guide rail 2 and the shutter may be wound around the roller (not shown).

[0030] When the roller shutter is unwound from the roller it passes down through the guide rail in the usual manner until the bottom lath abuts against the floor or other stopping mechanism indicating the end of the extension of the shutter. At this point, the split lath 10 then commences to retract causing the arm 32 to move towards the arm 30 which simultaneously causes the pivotable locking bars 16a and 16b to pivot outwardly so that once the piston head 46 is fully inserted in the cylinder 48 the locking bars 16a, 16b are extended outwardly to such an extent that they are located immediately below the blocking unit 6. In use, a corresponding blocking unit is located on the opposite side of the guide rail to engage with locking bar 16b. Alternatively, a blocking unit on the opposite wall of the guide rail may not be required but the blocking mechanism 4 is handed so that it may be located on either guide rail.

[0031] The invention may equally be applied to double skin or single skin laths.

[0032] The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

[0033] All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

[0034] Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

[0035] The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

Claims

1. A roller shutter locking mechanism comprising a guide rail for the slats of the shutter and a blocking unit located in the guide rail which cooperates with the slats when the roller shutter is in the closed position, characterised in that a locking unit extending from the slats of the shutter provides the said cooperation between the slats and the blocking unit, the locking unit having a blocking unit engaging position actuated when the shutter is closed and a disengaged position activated by the shutter being raised from above the blocking unit.

2. A mechanism according to claim 1, wherein the locking unit comprises a pivotable locking bar which pivots from a first position wherein it may engage the blocking unit when urged against it and a second position wherein it may not engage the blocking unit.

3. A mechanism according to any preceding claim, wherein the pivoting from the first to the second position is actuated by raising the shutter from above the blocking unit.

4. A mechanism according to claim 2 or 3, wherein the pivot of the locking bar is located below the blocking unit and the locking bar pivots outwardly from the slats to the blocking unit engaging position.

5. A mechanism according to any of claims 2-4, wherein the locking bar has at least one pivotable arm connected to its blocking unit engaging end which arm is pivotable at both its ends, the first end being connected to the locking bar and the second end being connected to a neighbouring slat so that upward movement of the said slat causes upward movement of the second end pivot of the pivot arm, thus causing the pivot arm to pivot downwardly and inwardly about the said second pivot which thereby causes the locking bar to retract inwardly so that engagement with the blocking unit is no longer possible.

6. A mechanism according to any preceding claim, wherein between neighbouring slats there is an expandable connection.

7. A mechanism according to any of claims 2-6, wherein a further pivotable locking bar and at least one arm are provided which are the mirror image of the first locking bar and arm and located adjacent to the first locking bar and pivot arm.

8. A mechanism according to claim 6, wherein the expandable connection is produced by a piston and cylinder arrangement.

9. A roller shutter having a locking mechanism in accordance with any of claims 1-8.

10. A locking unit in accordance with the characterising part of claim 1 which is adapted for use on doors, windows and other blockable opening/closing devices.

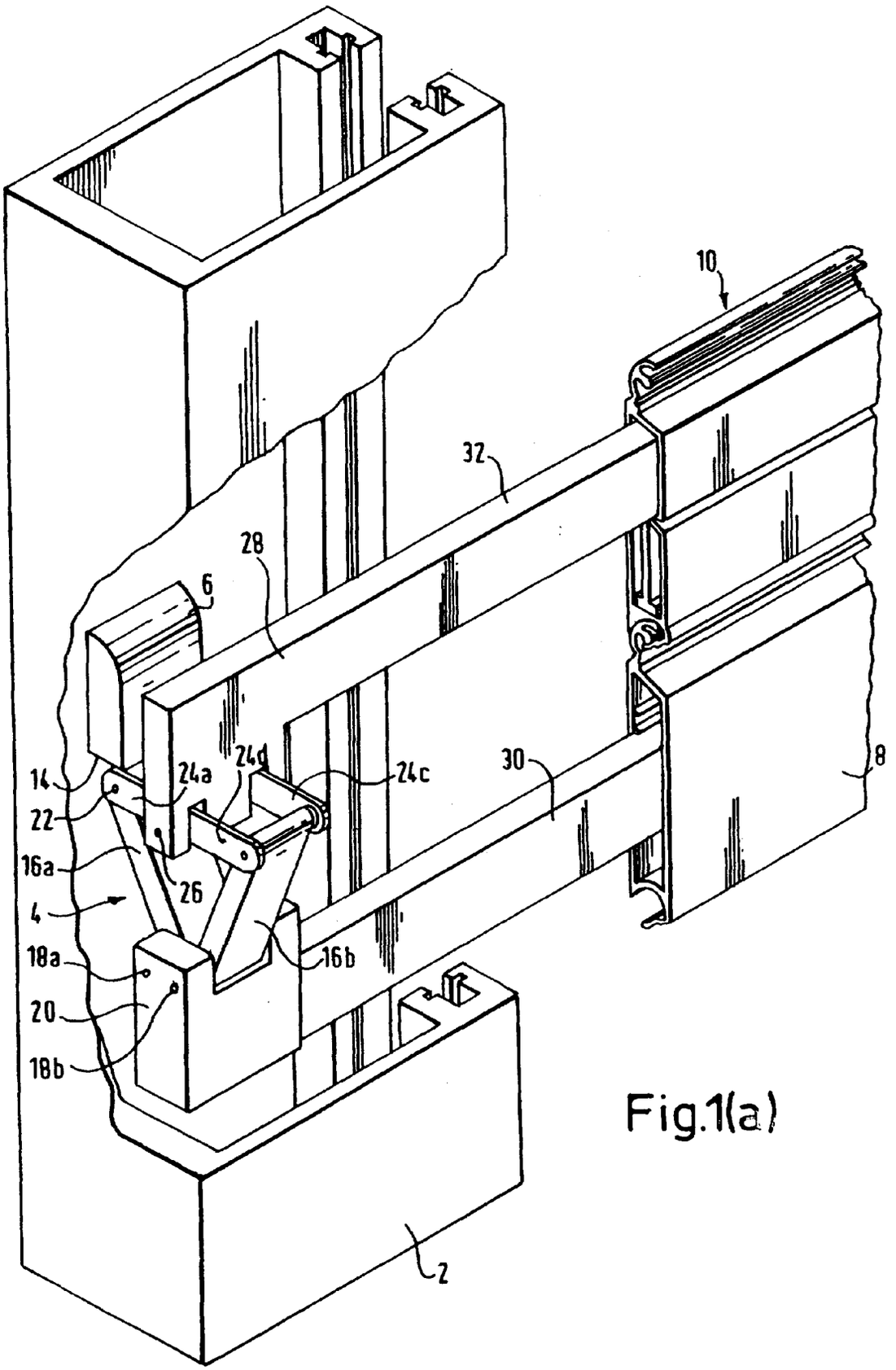

Fig.1(a)

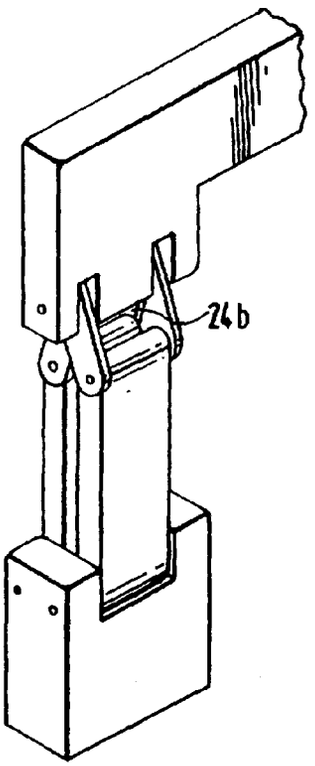

Fig.1(b)

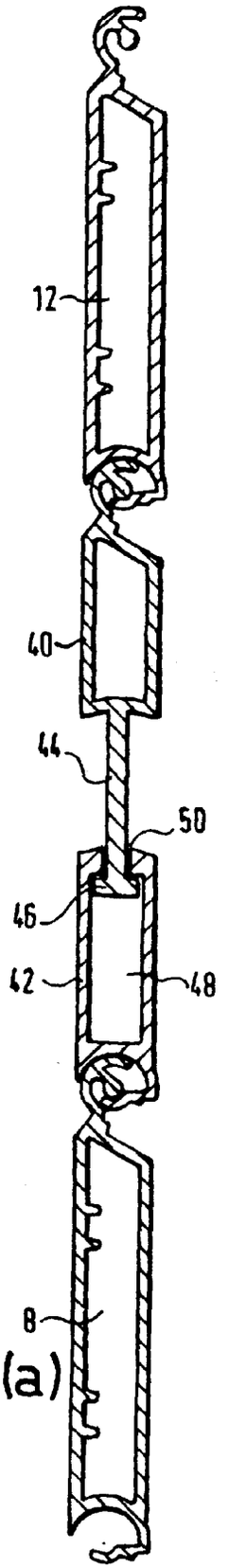

Fig.2(a)

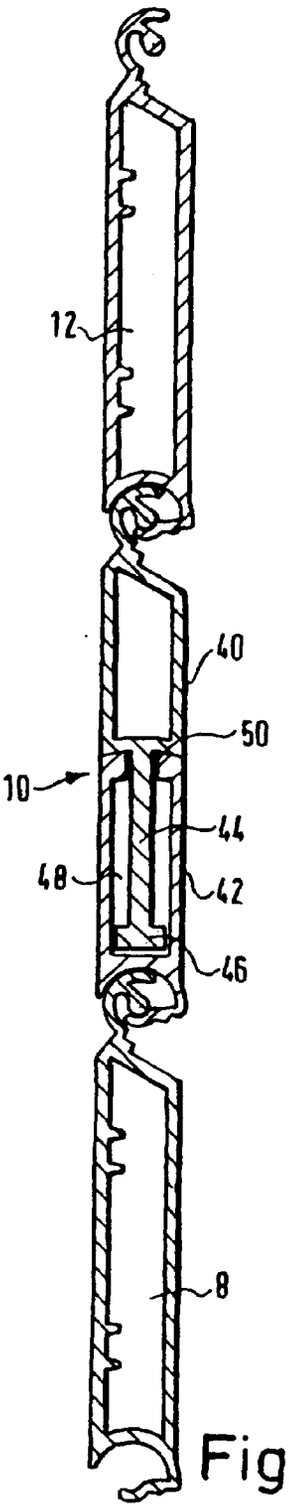

Fig.2(b)